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CLASSIFYING WILDFIRE CAUSES IN THE USDA FOREST SERVICE: PROBLEMS AND ALTERNATIVES

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ABSTRACT.—Discusses problems associated with fire-cause data on USDA Forest Service wildfire reports, traces the historical development of wildfire-cause categories, and presents the pros and cons of retaining current wildfire-cause reporting systems or adopting new systems.

KEY WORDS: Wildfire causes, wildfire reports, wildfire prevention.

Wildfire causes, entered on USDA Forest Service fire reports since 1905, are key elements in the development and analysis of Forest Service fire prevention programs. First devised to pinpoint how fires started, fire-cause categories were later expanded to include the persons responsible. The basic objective of these classifications is still to identify major fire causes, thereby helping land managers select fire prevention programs and allocate prevention resources[1]

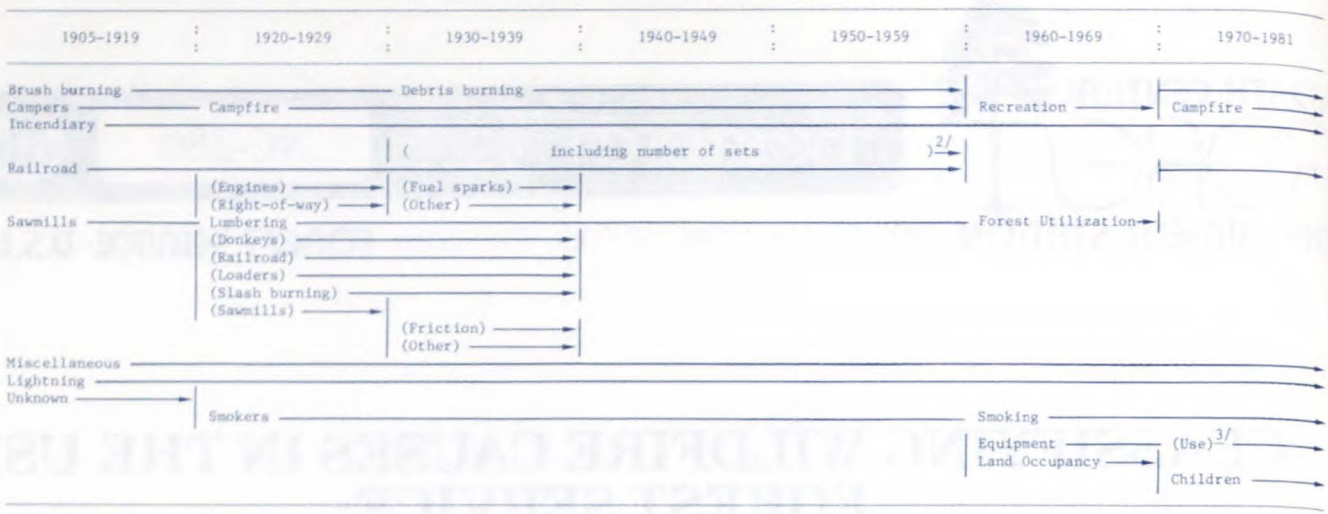
Due to several problems, however, accurate fire-cause information is often difficult to collect and report. This paper focuses on problems associated with documenting field data on the Forest Service Individual Fire Report, Form 5100-29. Persons making fire-cause entries on this form face two primary obstacles. The first is selecting the best fire-cause and class-of-people classification scheme from a few overlapping categories which are frequently broad and repetitious. The second is reporting the reliability of fire-cause information. The roots of the first problem lie in the historical development and use of fire-cause categories in the Forest Service; the second is a matter of form design.

The current (1970) Forest Service fire report contains four cause-related items (statistical cause, general cause, specific cause, and class-of-people) which evolved from the reporting system implemented in 1905.[2] The first fire-cause classification system used by the Forest Service contained eight general categories: brush burning, campers, incendiary, railroad, sawmills, miscellaneous, lightning, and unknown. These were expanded in the 1920's and 1930's, reflecting a need for greater fire-cause detail (table 1a). Except for a few minor changes, these general-cause categories remained fairly consistent for 40 years. In 1960, general fire-cause classifications were expanded and divided into two lists, statistical and land-use (table 1a, 1b). In 1970, land-use causes were renamed general causes, but both lists were retained

[1]*The focus is on human-caused wildfires because lightning fires are basically not preventable.*

[2]*Statistical causes are used primarily for compiling periodic, general information reports. General causes show the major types of land-use activities responsible for fires, and specific causes show detailed activities or ignition sources of fires. Class-of-people refers to the group of persons to which an individual responsible for a fire ignition belongs.*

Table 1a.--General/statistical cause categories: 1905-1981[1/]

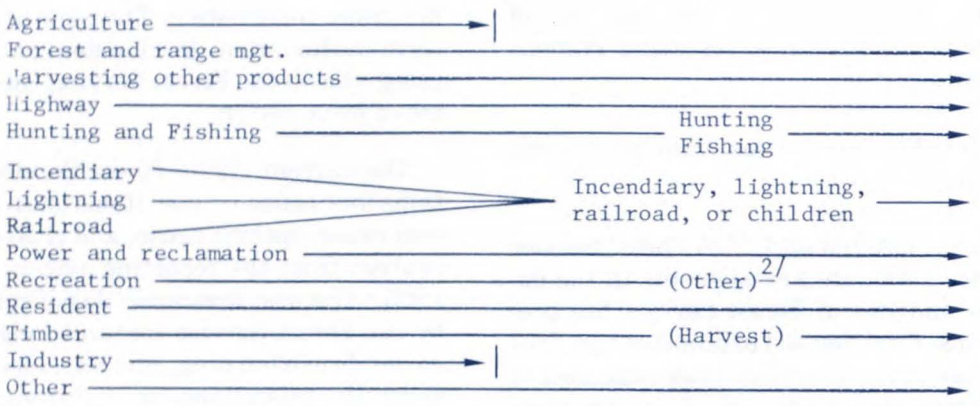


1/ In 1960 general causes were renamed statistical causes.

2/ Parentheses under the line show additional information reported with the primary general cause.

3/ Parentheses on the line show words added later to supplement or clarify the cause classification.

Table 1b.--Land use/general cause categories used in conjunction with statistical cause[1/]



1/ Land use categories from the 1960 decade were renamed general causes in 1970.

2/ Parentheses on the line show words added later to supplement or clarify the cause classification.

in a slightly modified form. Even with all these changes since 1920, six of the eight general-cause categories, although slightly modified, are still used today: debris burning, campfire, incendiary, railroads, miscellaneous, and lightning. Approximately three-fourths of the specific-cause categories have been retained, although modified since their introduction in 1940 (table 2).

Instituted in 1920, class-of-people categories remained fairly uniform for 40 years before their extensive revision in 1960 (table 3).

Looking over the past 75 years of changes in fire-cause reporting, however, we can conclude that fire-cause categories have changed little in form. While this lack of change ensured consistency of fire report

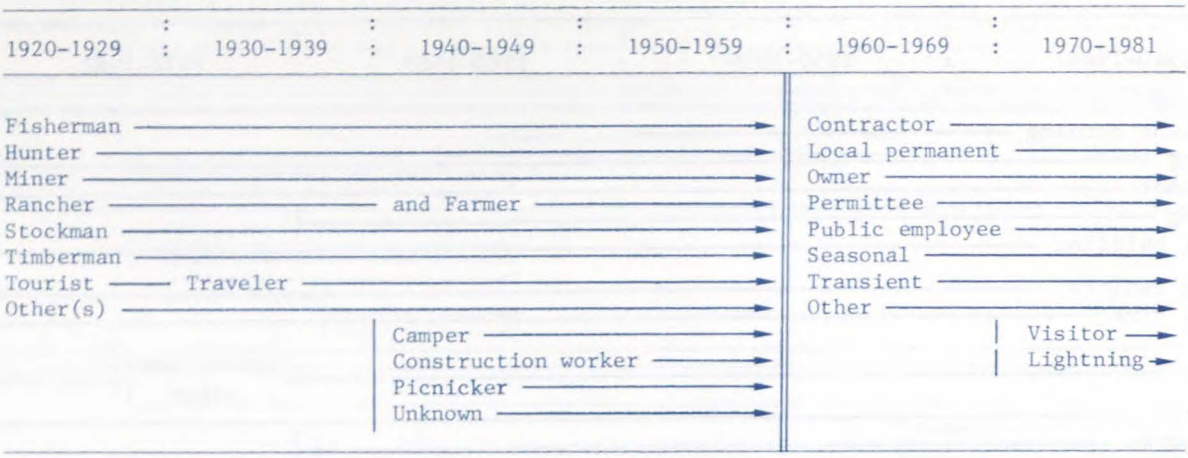
Table 2.--Specific cause categories: 1940-1981[1/]

1940-1949	1950-1959	1960-1969	1970-1981
Berry land burning			
Blasting			
Brake shoe			
Branding			
Burning building			
Burning vehicle			
Cooking fire			
Exhaust			(power saw)[2/] (other)
Fireworks			
Fuel sparks			
Fusee			
Glass			
Grudge fire			
Hot ashes			
House/stove flue sparks			
Insect/snake control			
Job fire			
Land clearing			(burning)
Lightning			
Logging line			
Meadow burning			Field burning
Moonshine			
Oil/gas well			
Playing with matches			
Power line			
Pyromania			
Range burning			
Refuse burning			Trash burning
Repelling predatory animals			
Right-of-way clearing			(burning)
Rubbish disposal			Burning dump
Safety strip burning			
Slash disposal			(burning)
Smoking			
Smoking bees/game			
Spontaneous combustion			
Tie disposal			
Warming fire			
Other			
Unknown			
	Airplane	Aircraft	
		Burning sawmill	
		Burning tobacco beds	
		Mill waste	
		Prescribed burning	Resource mgt. burning

[1/] Specific causes were not reported from 1905 to 1939.

[2/] Parentheses on the line show words added later to supplement or clarify the cause classification.

Table 3.--Class-of-people categories: 1920-1981



data, it also created a major problem cited above—overlapping and repetitious fire-cause categories.

Statistical and general fire causes, for instance, include a combination of overlapping categories; as a result, more than one cause class can be assigned to a given fire. These causes include categories of people (children, resident), activities involving intentional use of fire (e.g., camping, debris burning, smoking, incendiarism), and work-related or recreation activities incidentally causing wildfires (e.g., equipment use, timber harvest, fishing, hunting) (table 1a, 1b). In addition, individuals responsible for causing wildfires can be classified in many ways using the current class-of-people categories (table 3). For example, a person could be both an owner and a local permanent or both a permittee and seasonal resident. Such overlapping categories result in multiple classification schemes for a given fire cause and make it difficult to determine from fire-report statistics the actual cause and person responsible for a particular wildfire. To illustrate, a dump fire set by one or more unidentified persons is reported in Region 9 using seven different cause and class-of-people combinations (table 4).

Compounding the problem of overlapping categories is the broad (one category encompasses a host of situations) and repetitious nature of the fire-cause reporting system. A classic example of this problem is the use of the following categories to describe a known fire cause:

Statistical	General	Specific	Class-of-People
Miscellaneous	Other	Other	Other

An investigation revealed that a wildfire was started by an unidentified person who, after lighting a cigarette and falling asleep in bed, ignited the mattress. Upon awakening and finding the mattress on fire, he dragged it out of a bunkhouse and abandoned

Table 4.--Classifications of dump fires in Region 9

	Statistical cause	General cause	Specific cause	Class-of-people
1.	Incendiary	Incendiary	Burning dump	Local permanent
2.	Incendiary	Incendiary	Grudge	Local permanent
3.	Debris burn	Other	Trash burning	Visitor
4.	Debris burn	Resident	Burning dump	Local permanent
5.	Debris burn	Incendiary	Trash burning	Local permanent
6.	Debris burn	Other	Burning dump	Local permanent
7.	Miscellaneous	Resident	Burning dump	Local permanent

it in the woods, starting a wild fire. For lack of a better method, this fire was reported as "Miscellaneous, Other, Other, Other." Although this example may be atypical, it does illustrate the information lost when a reporter classifies a fire-cause using the current system. Even though many fire causes can be pinpointed accurately and facts essential to a sound fire prevention campaign can be assembled, this information is either frequently submerged in a few broad, repetitious fire-cause categories, or it is not recorded at all.

A second major reporting problem is the lack of adequate methods for indicating the reliability of fire-cause data (Main and Haines 1974). Some causes are known with such certainty that legal action can be taken, but others are completely unknown. Once entered on a fire report form, however, reliable causes are indistinguishable from unreliable ones. With no "unknown" category available, an unknown cause is classified typically as a smoking, an incendiary, or a miscellaneous wildfire. Because reporters cannot indicate the reliability of fire causes but must report both known and unknown causes, the accuracy of fire-cause data is often highly questionable, leading to erroneous assumptions about fire prevention problems.

DISCUSSION AND CONCLUSIONS

Decade-to-decade modifications in the Forest Service fire-cause reporting system during the past 75 years brought little more than cosmetic change. As a result, we have inherited a system that has flaws but is relatively simple to use and historically compatible with previous fire report data.

One of the dilemmas facing managers today is whether to maintain the current system, modify it, or replace it.[3] Resolving this dilemma depends, in part, on how the data are used and to whom they are most important. If, for example, upper level managers need general fire-cause information for annual reports and statistics, budgetary and financial assistance requests, or other administrative purposes, the current system is probably adequate with little or no modification. On the other hand, the current system does not provide the data needed to plan, implement, and analyze fire prevention programs in as much detail and as accurately as fire prevention specialists might desire. Two possible remedies would be to modify the current system or adopt a completely new one. Although the first alternative again involves cosmetic change, it does ensure historical data compatibility. With a few improvements (e.g., including "certainty of cause" categories; expanding categories; analyzing and standardizing reporting procedures for a given fire cause such as dump fires), it also eliminates some of the problems cited above, thereby increasing data accuracy and reliability. The second alternative, going to a new and perhaps better reporting system, may also be beneficial. One method, called the "Building Block" system, is currently under consideration by State and Federal land managers.

This system includes multiple categories that classify the form of heat energy (e.g., flames, sparks, and hot surfaces from a variety of sources) that ignited the fire; the equipment that provided the heat that started the fire; the type of material or kindling fuel first ignited; and the reason why the form of heat energy and the material first ignited combined to start a wildfire. It also incorporates into the class-of-people categories the types of persons responsible for fires and the person's age, sex, and primary activity when the fire started. Even though the Building Block system has some drawbacks, such as its lengthiness, it does eliminate the problems with the current system and yet enables statistical fire-cause categories, as we presently know them, to be identified.

No fire-cause reporting system will ever be perfect. But, fire managers, when deciding which system to use, must consider the information they need and the level of resolution, the degree of error they are willing to accept, and the operational simplicity or difficulty of each system. These factors must also be weighed with the current drive to adopt a standardized State and Federal fire-cause reporting system and with the desire to maintain historical data compatibility.

[3]*Because many State and Federal agency fire-cause reporting systems are similar in many respects to the Forest Service system, this problem also faces fire managers outside the Forest Service.*

LITERATURE CITED

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